The Future of Milstar For Command, Control, and Communications of Strategic Bombers in Conventional Operations (U)

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(U) Abstract

(U) The authors review and comment on the use of strategic bombers in a conventional role in the European theater. They present recommendations for the use of Milstar in likely scenarios for long range bomber force projection. The study answers the question: "How can Milstar be used in the planning, organizing, coordinating, directing, and controlling of long range strategic bombardment in Europe."

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I. Introduction

Background

A new SAC organizational structure has been proposed to increase the speed and efficiency of planning for conventional bombing missions in the European theater [5].

This structure, if adopted, will be used to plan missions [redacted]

Milstar is a new military communications satellite system due to begin operation in the early 1990s. It is being designed to offer robust and reliable communications throughout the conflict spectrum to command posts, aircraft, tactical ground forces, and other military users. By using a number of satellites with the ability to crosslink, Milstar users around the world will be able to communicate with each other.

Objective

The objective of this paper is to examine the communications requirements for the organizations involved with the planning and use of strategic bombers in a conventional role in the

European theater under the new proposed structure, and to determine how those requirements can be met with Milstar.

Scope and Sequence

Although SAC resources will be used for a number of different types of missions during a theater conflict (including refueling, minelaying, intelligence collection, etc.), the new proposed SAC structure (and, therefore, this paper) is limited in scope to conventional bombing in the European theater. (Other missions, and other areas of operation, may be examined in subsequent studies (5)). Chapter 2 of this paper discusses this proposed SAC structure and examines communications requirements, Chapter 3 discusses some of the limitations of current communications in Europe and recommends a Milstar architecture to support the structure, and Chapter 4 offers a recommendation for further study.

Assumptions

It is assumed the SAC structure will be implemented as described in Chapter 2. Any changes in this structure that affect communications requirements will, of course, make it necessary to reexamine the recommended Milstar architecture and amend it as required.

It is also assumed Milstar terminal equipment, and communications equipment to be tied to the terminals, will be available, as necessary, to implement the architecture described in Chapter 3. In some cases, the SAC organizations described in

the proposed structure will be co-located with other units already programmed to receive Milstar capability. If the sharing of terminals is considered in these cases, it should be kept in mind that, during a European conflict, some units may have to relocate often (probably on short notice), both to decrease their vulnerability and to meet new and (possibly) unforeseen requirements.

Milstar satellite resources are assumed to be available to implement the architecture described in Chapter 3. If all of the necessary resources are not available, some of the considerations which should be made before combining the recommended networks are discussed.

Finally, it is assumed the proposed SAC architecture will be given a priority sufficient to operate on the Milstar system during the time it is needed--during crises and wartime.

II. Requirements

This chapter describes the proposed SAC structure to support conventional bombing in Europe. The first section discusses where SAC personnel will be located and what they will do, the next section describes how mission planning will occur within this structure, and the third section describes the communications requirements for each proposed group of SAC personnel.

Where SAC Personnel Will Be Located

A small advanced echelon (ADVON) of SAC personnel will be located at the Supreme Headquarters Allied Powers Europe (SHAPE) in Mons, Belgium. There will be fewer people at this ADVON than called for in the current plan, and their duties will be to advise SACEUR on B-52 use, availability, status of resources, and target selection. SACEUR is responsible for taking target nominations from subordinate commands and making the target selections. The SHAPE ADVON will then pass on these selections, and any special guidance, to ADVON personnel located at the three Major Subordinate Commands (MSCs) [5:9-10].

The MSCs are Allied Forces Northern Europe (AFNORTH) at Kolsaas, Norway, Allied Forces Central Europe (AFCENT) at Boerfink, Germany, and Allied Forces Southern Europe (AFSOUTH) at Proto, Italy. Each MSC will have a small ADVON of SAC personnel who will advise the MSC's CINC on B-52 use, availability, status of resources, and target selection. These ADVONs may help their MSC prepare target nominations for submission to SACEUR. Once

targets are selected, the ADVON will determine the desired mean point of impact (DMPI), recommended axis of attack (AOA), and recommended time on target (TOT), and will pass this information, along with any special guidance, to planning elements located at the bombers' Wartime Beddown Locations (WBLs) [5:9-10].

Small SAC staffs may be located with various organizations responsible for airspace control and the coordination of necessary support packages (such as electronic countermeasures, fighter escort, etc.). These organizations include: the United Kingdom Regional Air Operations Centre (RAOC) at High Wycombe, UK, the 2nd Allied Tactical Air Force (ATAF) at Maastricht, NE, 2 ATAF's Sector Operations Center (SOC) 1 at Brockzetel, GE, 2 ATAF's SOC 2 at Uedem, GE, 4 ATAF at Ruppertsweiler, GE, their SOC (SOC 3) at Boerfink, GE, 5 ATAF near Vicenza, IT, their 1 Regional Operations Center (ROC) at Monte Vende, IT, 5 ATAF's 3 ROC at Martina Franca, IT, 6 ATAF at Izmir, TU, the Hellenic TAF (HTAF) at Larisa, GR, and the Allied Forces Baltic Approaches (BALTAP) at Karup, Denmark. 2 ATAF and 4 ATAF are Principal Subordinate Commands (PSCs) under AFCENT, 5 ATAF, 6 ATAF, and the HTAF are PSCs under AFSOUTH, and BALTAP is a PSC under AFNORTH [1] [5:9-11].

SAC logisticians will be located at the USAFE Operations Support Center (OSC) at Ramstein, GE, to report on force status and to coordinate logistics support with the bomber units [5:10-11].

SAC representatives will also be located at

Most of the actual mission planning will occur at the WBLs located at bases in, or near, Europe. Planners at these bases will use mission planning systems such as the Deployable Aircraft Planning System (DAPS) or the Deployable Strategic Mission Data Preparation System (DSMDPS) [5:9-11].

How Mission Planning Will Occur

In the European theater, potential targets are nominated up through the command structure to SACEUR at SHAPE. Targets are selected based on these nominations, advice from the SHAPE ADVON, and bomber availability information. The SHAPE ADVON then passes the target selections and any special guidance to the appropriate MSC's ADVON [5:10].

The MSCs' ADVONs take the target selections from SHAPE and plan the DMPI, and a recommended AOA and TOT, obtaining information, if required, from the COIC. They pass this information, along with any special guidance, to the unit planners at the WBLs. They also pass preliminary information to the appropriate airspace control authorities, and begin coordination with the MSC/PSC personnel for the development of appropriate support packages (if required) [5:10].

The unit planners at the WBLs take the DMPI, AOA, and TOT information from the MSCs' ADVONs, and target information (as required) from the COIC. They then plan the mission in detail using DAPS (or DSMDPS), provide detailed airspace control information to the proper authorities, and coordinate details on the support packages [5:10].

The bombers then fly the mission.

Force availability and status are sent from the WBLs to SHAPE and the OSC. Logistics updates for SAC and other units located at the WBLs are periodically sent to the 3rd and 16th Air Forces' Logistics Readiness Centers (LRCs), who inform the OSC.

Required Communications

All of the information sent between organizations in the proposed SAC structure, whether via voice circuits or digital data circuits (including teletype), will require secure means for transmission.

In many cases, the information sent between organizations will be structured, short, and directive in nature. This is often best sent over digital data systems. Lower bit rates are desirable (when the amount of information being sent makes this possible) in the Milstar system, both for robustness and channel availability. An added advantage of digital data systems is that records can be easily kept.

The communications requirements are shown in Figures 1-3. In these figures, low bit rate data flow is shown where it is anticipated digital data circuits of 2400 bps or less will be sufficient.

Flow of Target Information. Figure 1 shows the flow of target information from nomination and selection through detailed planning at the WBLs.

As described earlier in this chapter, SHAPE is responsible for taking target nominations and making selections. This is

not part of the SAC structure and existing communication links are fairly good at this level of command [1].

The proposed SAC structure should not require as high of a data rate since,

With the current SAC structure,

These delays are primarily a function of the amount of traffic on the communications system and can be improved by sending less traffic

and by assigning appropriate priorities to SAC traffic. (It should be noted that assigning higher priorities to one user of a system improves his throughput at the expense of other users, the total average delay for all users of a system will remain the same.)

Although speculative, it seems likely, given the above information, that low data rates (perhaps as low as 75 bps) between the MSCs and WBLs will be adequate.

tion will be structured and short

and can probably be handled

on a digital data system.

Each of the MSCs and WBLs will also require connectivity with the RAOC, the PSCs, the SOCs, and the ROCs to coordinate airspace control and support packages. (When considering these requirements it should be noted SOC 3 is co-located with AFCENT at Boerfink, GE.) Airspace control may be fairly directive at this level, however coordination of the support packages will probably require some discussion between the organizations. This makes voice connectivity between these organizations, possibly with the ability to conference, highly desirable. Digital data connectivity between the MSCs and RAOC, the PSCs, the SOCs, and the ROCs may also be desirable to back up the voice capability and to issue the final decisions.

Under the proposed structure, each WBL will require much more intelligence and mission planning information than it currently receives. Several systems are proposed, or are under development, which may provide this information. The Deployable Aircraft Planning System (DAPS) is a deployable IBM 370 computer system configured to assist in mission planning. The DAPS was originally conceived as a system to aid ADVON planners, however,

if the proposed changes in the SAC structure are implemented, they may be designed to deploy to the WBLs. As currently planned, the DAPS will take most of its data with it, but will require frequent updates on weather, intelligence information, etc. Information may come through Mobile Intelligence Kits (MIKs). The concept is for the MIKs to connect to various SAC and European theater data bases to provide up to date information. An important element of the MIK is the Digital Intelligence Transmission System (DITS) which will transmit imagery data. To transfer this information, high bit rates (4.8 Kbps or 9.6 Kbps) will be required [8].

Flow of Availability/Status. The flow of status and availability information is shown in Figure 2. The WBLs will need to provide this to the OSC (with action copies going to the MSCs and SHAPE). This information will not be as time critical as the other messages described above, but must reach the OSC, SHAPE, and the MSCs in time to plan the next bombing cycle. A digital data system using low data rates should be adequate to transmit this information. The OSC may send an elaboration or summary message to SHAPE detailing bomber availability. (Logistics information will not require SAC unique communications, since all of the units at the WBLs send and receive this information through the 3rd or 16th Air Forces' LRCs.)

Bomber Target Changes. The flow of information

is shown in Figure 3.

Since positive acknowledgements will be necessary, and requests for clarification may be required, information will have to flow in both directions.

SAC Headquarters. Although not directly involved in the conventional bomber mission planning cycle in the proposed SAC structure, CINCSAC, and other elements within SAC headquarters, would naturally have a great deal of interest and should probably have the capability to receive action copies of the digital data messages described above.

III. Proposed Architecture

[redacted] In this chapter reasons for using Milstar to meet the communications requirements identified in Chapter 2 are discussed, and a possible Milstar architecture to support the proposed SAC structure is described.

[redacted] Current Limitations and Milstar

[redacted] This technique for managing the system will create [redacted] traffic delays for higher priority users (although users within a network will still have

contend with each other), at the expense of totally denying communications to lower priority users when satellite resources are not available. [redacted]

[redacted] A Proposed Milstar Architecture

[redacted] In this section, a Milstar architecture is recommended to support the proposed new SAC structure. Milstar can support bit rates of 75, 150, 300, 600, 1200, and 2400 bps, and, therefore, should be capable of handling the communications shown in Figures 1-3 to require low data rates. Since the new SAC structure has not yet been tested, it is difficult to determine precisely how much traffic will have to flow between each organization and, therefore, specific bit rates are not recommended. In general, bit rates should be as low as possible to pass the information since lower bit rates on Milstar are more robust and use fewer of the system's resources.

[redacted] Milstar can also support secure voice circuits (by digitizing the voice and transmitting the signal at 2400 bps), but these circuits are resource intensive.

[redacted] Communications on Milstar can take place between network members over networks with preassigned priorities, or between any

two users on a point-to-point basis when resources are available [4:26]. Since all of the communications requirements described for the SAC structure will be time critical, and are likely to be needed during a European conflict when Milstar (as well as other communications) resources will be in short supply, networks of SAC organizations with appropriate priorities will be vital to ensure communications.

There cannot be more than one independent call on a given Milstar network at a time. Therefore, there is a trade off between the number of networks assigned for SAC use in Europe (with the resources they will use) and the number of simultaneous calls that can take place. For this reason, although six (or seven) networks are proposed to support the SAC structure, some may have to be combined, at the expense of increased transmission delay (and, possibly, increased bit rates), in order to preserve Milstar resources.

To support the low data rate requirements shown in Figure 1, three half-duplex networks are recommended. These are shown in Figures 4-6. (The term "hybrid network", in the figures indicates some users will be able to transmit and receive while others will be able to receive only.) Each MSC will control a network and will be able to transmit and receive. The COIC and each of the WBLs will belong to all three networks and will be able to transmit and receive, while the RAOC, PSCs, SOCs, ROCs, and SAC headquarters will belong to all three networks but will

be able to receive only. (A particular MSC may not normally need to communicate with many of the organizations responsible for airspace control and providing support packages. These organizations are included in all three networks, however, to increase the MSCs' ability to handle unusual and/or unforeseen circumstances. Since the RAOC, PSCs, SOCs, and ROCs will not be transmitting over these networks, and each organization will need terminal equipment to receive information from its own MSC, it costs nothing to include them in all three networks.)

As an alternative to the architecture described above, the COIC could control a half-duplex network with the MSCs and WBLs as members, where they all have the ability to transmit and receive. The other three networks would be controlled by the MSCs, who will transmit only, and have the WBLs, RAOC, SOCs, ROCs, and SAC headquarters as members, who will receive only. These four networks are shown in Figures 7-10. (The term "conference network", in Figure 7, indicates all members may transmit and receive.) This structure will allow requests and responses for target information at the same time support package directions and assignments to the WBLs are being transmitted, but will require one more network than in the architecture described above.

As stated above, secure voice networks will be resource intensive in the Milstar system. Therefore, a single, half-duplex, secure voice network to support the requirements shown in Figure 1 is recommended, and this should probably only be acti-

vated if other secure voice communications (such as STU-IIIs using commercial or military telephone lines, for example) have failed. This network is shown in Figure 11.

As discussed above, the high data rate information shown going to the WBLs in Figure 1 will require at least 4800 or 9600 bps data and, therefore, cannot be supported by the Milstar system. Since the DITS, MIK, and other systems using this information are still in the planning and development stages, these requirements may change.

A single half-duplex data network is recommended to support the availability and status requirements shown in Figure 2. The OSC and WBLs would have the ability to transmit and receive on this net while SHAPE, the MSCs, and SAC headquarters would be able to receive only. This network is shown in Figure 12. The information sent over this network would not be as time critical as other communications discussed in this study, therefore, if networks have to be combined to conserve resources this should be a candidate, with this information assigned a low internal network priority in the combined network.

[redacted]

(SAC headquarters should have the ability to receive an action copy for information purposes.) [redacted] Milstar reportback service will not be required. [redacted]

IV. Conclusions

Discussion

The Milstar architecture recommended in Chapter 3 is based on the assumption that some, but not an indefinite amount, of Milstar's resources will be available to support the SAC communications requirements for conventional bombing. In other words, only a finite number of networks will be available and members will have to share access within each network.

Since the proposed SAC structure is now only in the conceptual stage, it is difficult to know many of the details of the communications between organizations. Who will need to talk to who, and what they will say, are known, but how often they will communicate and for how long a time, are, in many cases, unknown (and could well change depending on many specific factors). For example, the MSCs, under certain circumstances, may issue a number of target assignments to the WBLs in short messages throughout the day, or they may issue all of the day's assignments in one longer message. Determining data such as this will make it possible to refine the proposed Milstar architecture to provide sufficient connectivity while efficiently utilizing resources.

Recommendation For Further Research

When the first exercises are conducted testing the new SAC structure, specific parameters of the communications between the organizations should be recorded. Especially, the time each

call is made, call duration (at whatever bit rate), the prevailing conditions being simulated, and the call content should be recorded.

One way of obtaining this information (and probably testing other aspects of the proposed SAC structure) that may be cost effective, would be to simulate the SAC organizations to be located in Europe with experts gathered at one location (SAC headquarters, for example). These experts could take inputs and plan missions as they would in Europe, using local communications (such as computers tied together with a local area network) to simulate Milstar and other long haul communications systems.

Conclusion

The Milstar architecture described in Chapter 3 should be able to meet some of the communications requirements for the proposed SAC structure. As the structure is tested and communications data collected, specific bit rates can be determined and the architecture can be refined to best use available resources.

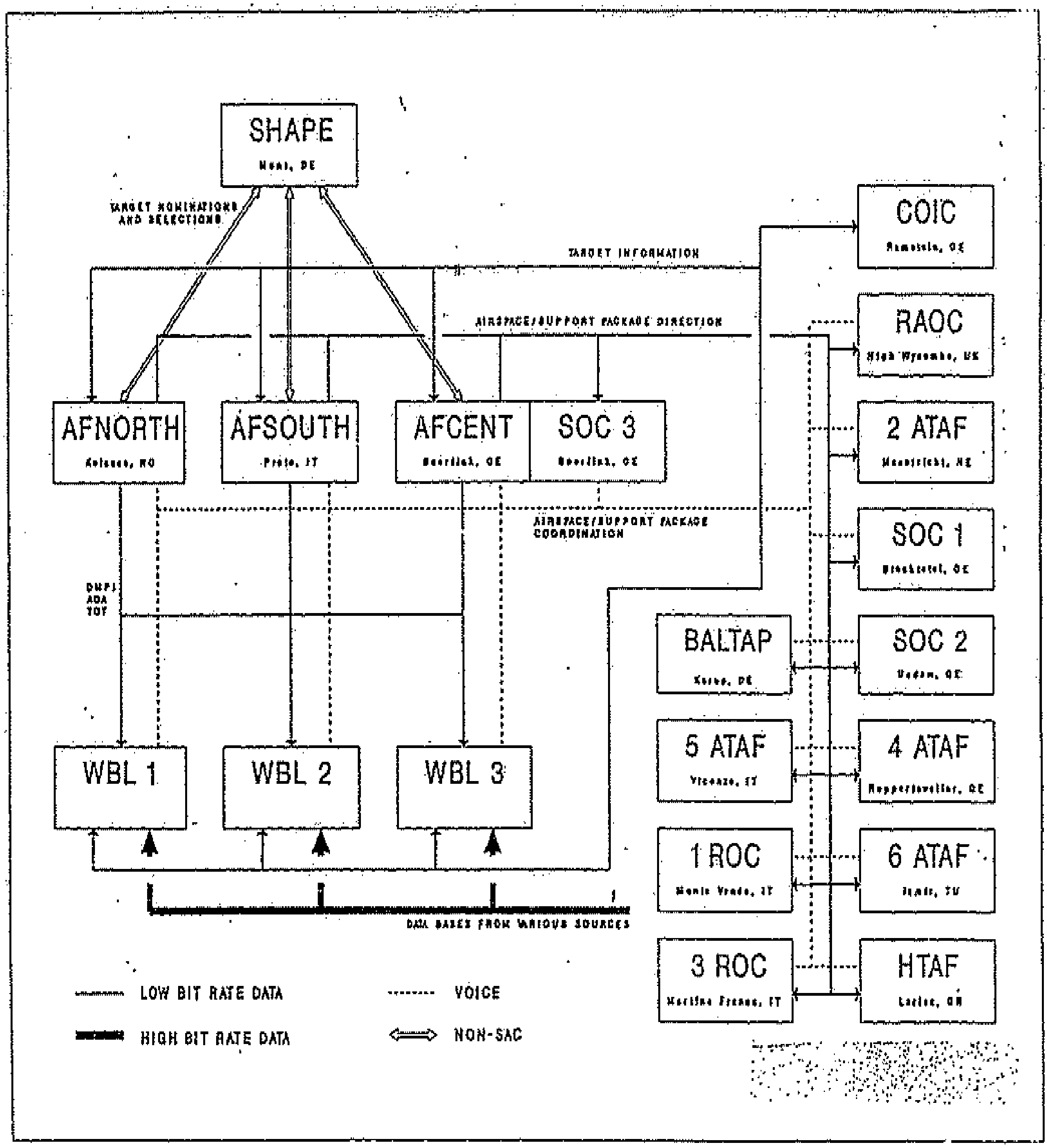

Figure 1. Flow of Target Information

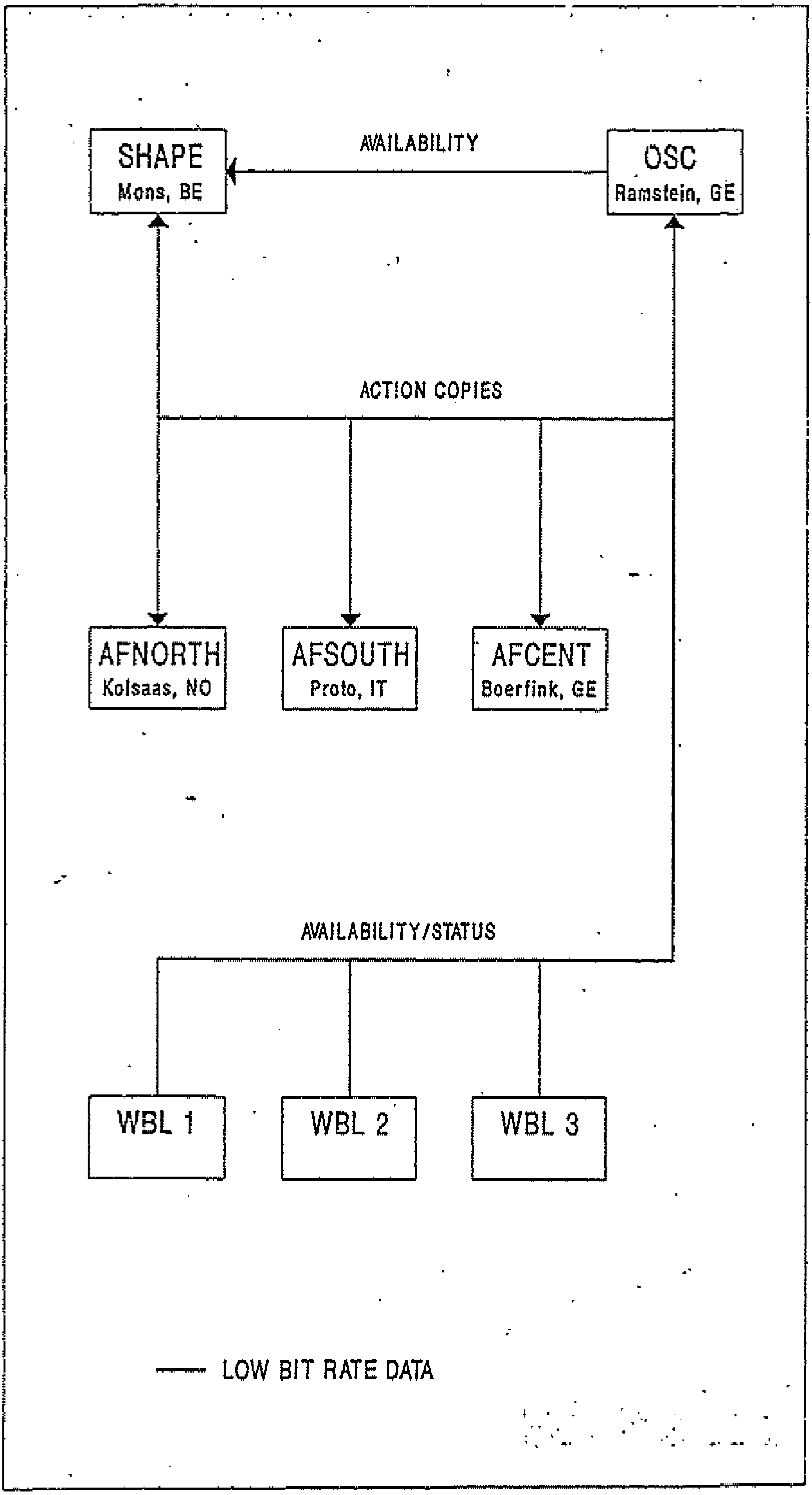

Figure 2. Flow of Availability/Status

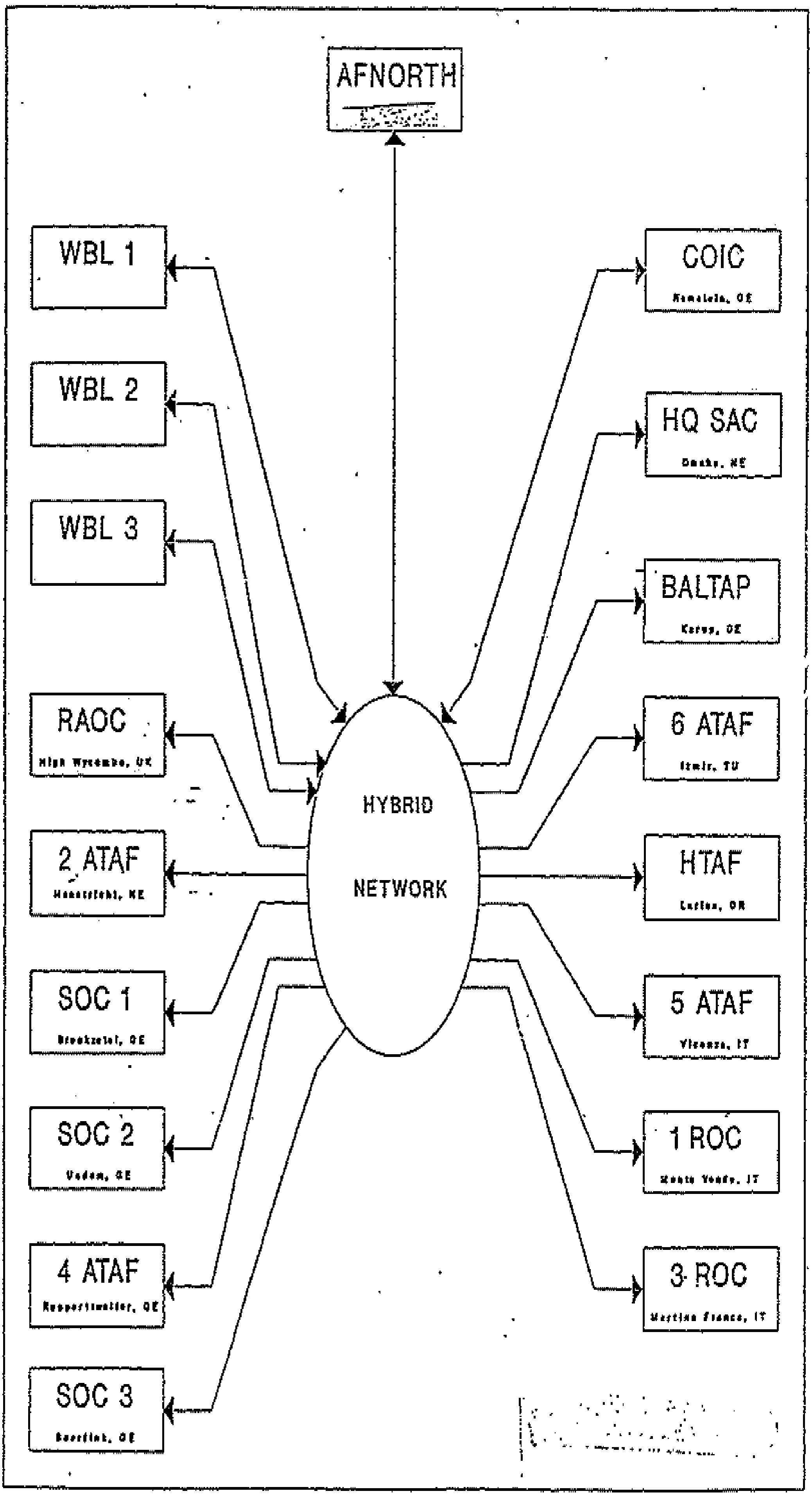

Figure 4. AFNORTH Milstar Target Flow Network

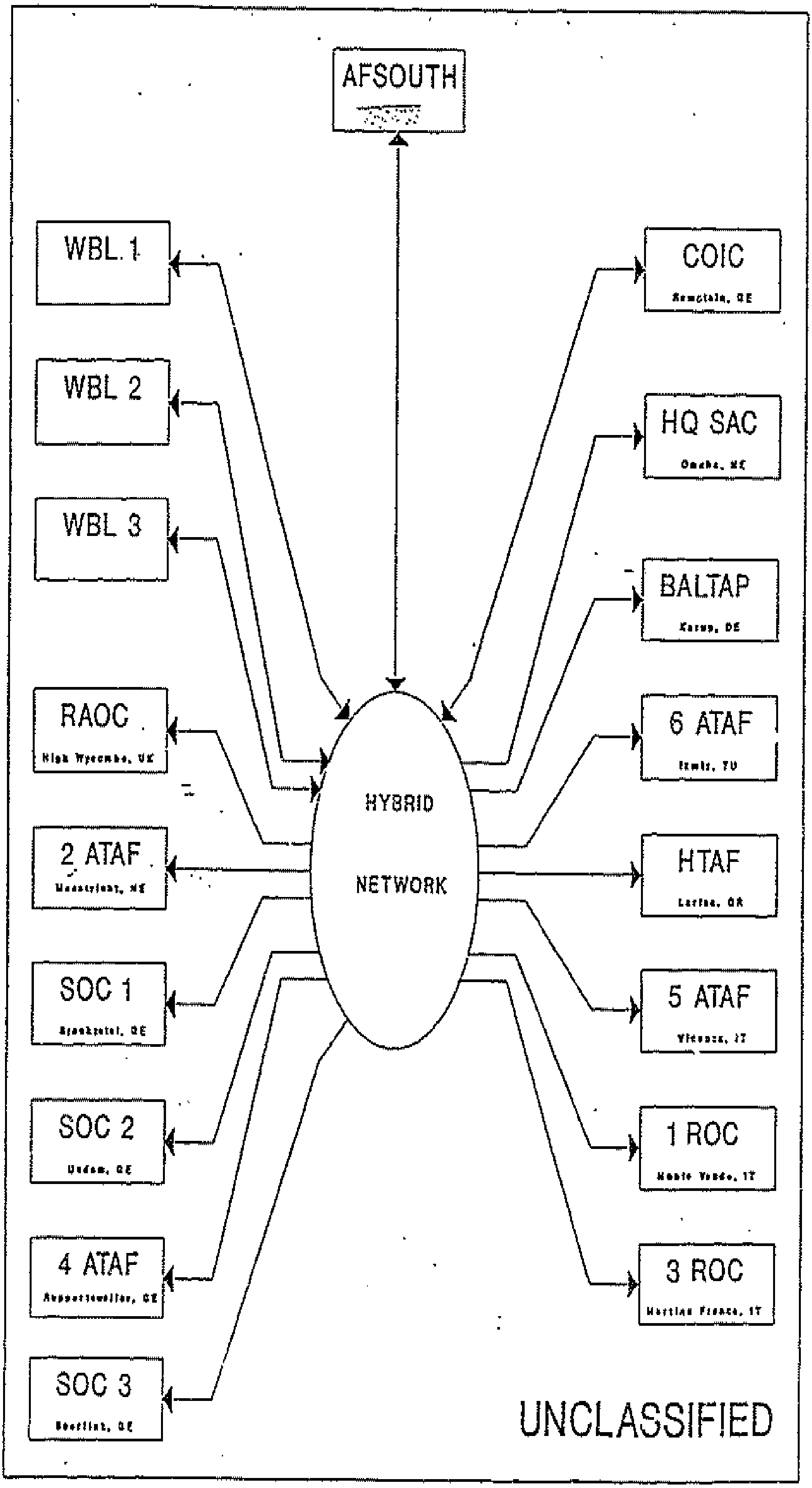

Figure 5. AFSOUTH Milstar Target Flow Network

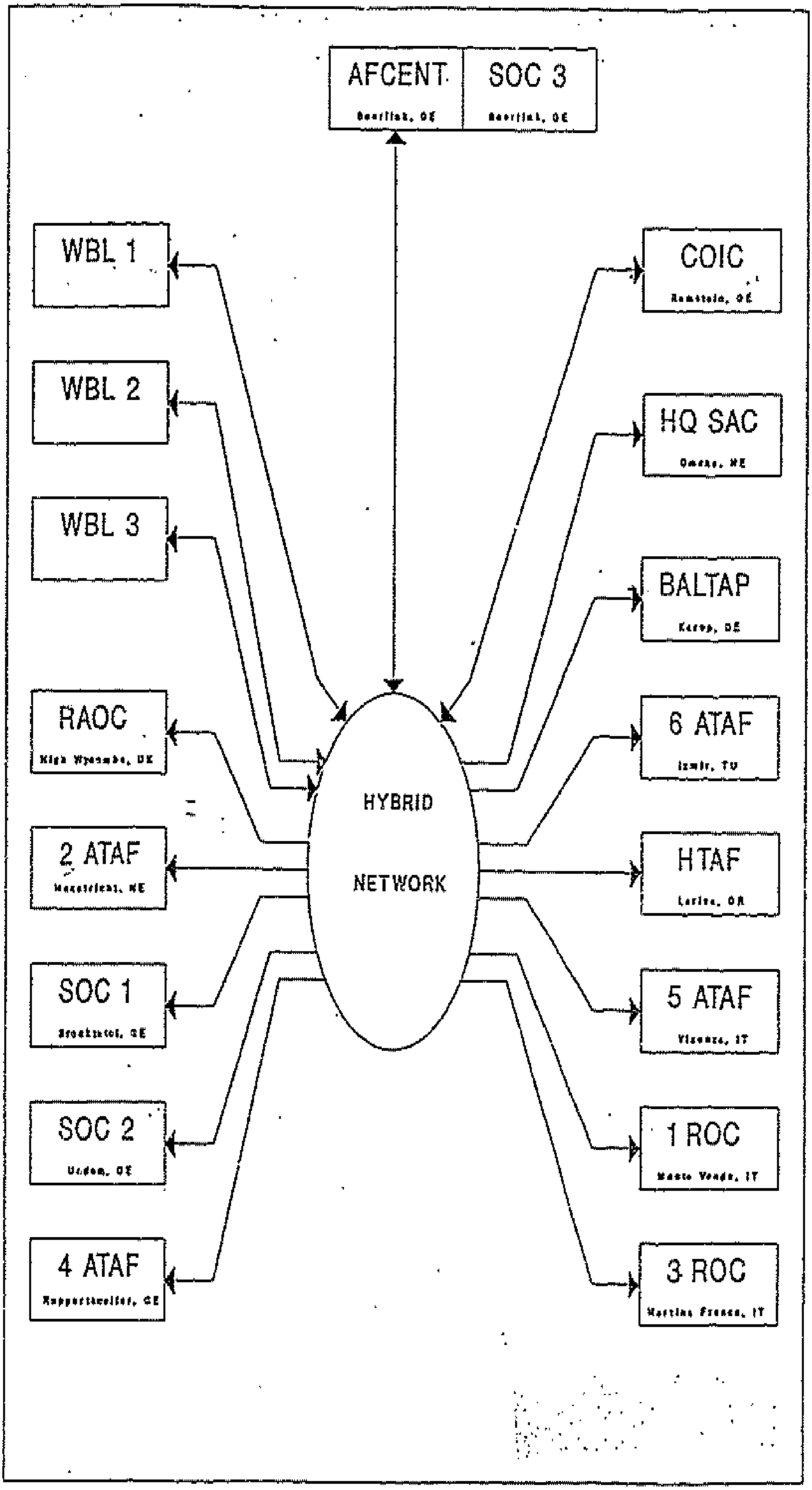

Figure 6. AFCENT Milstar Target Flow Network

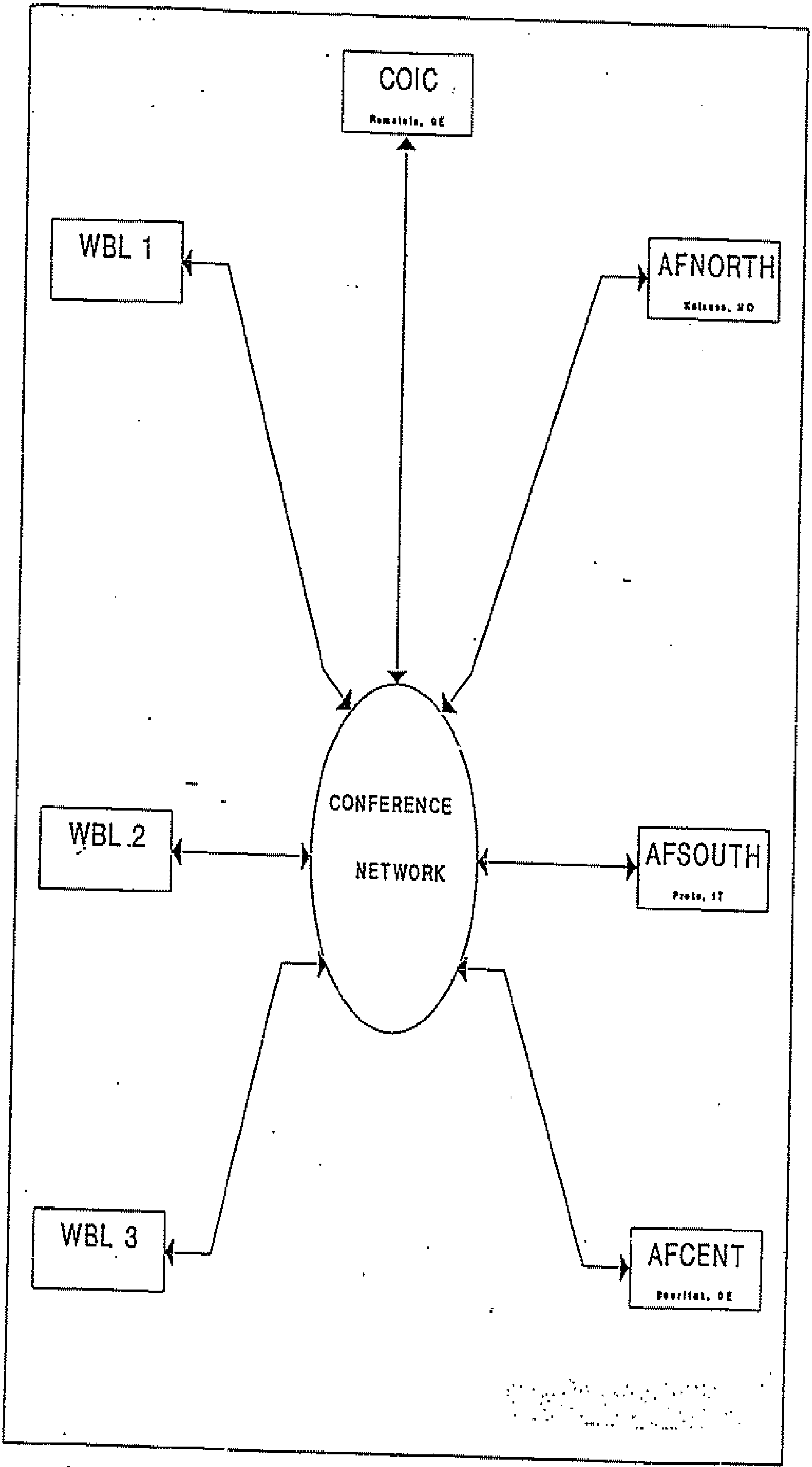

Figure 7. Alternative Milstar Target Information Network

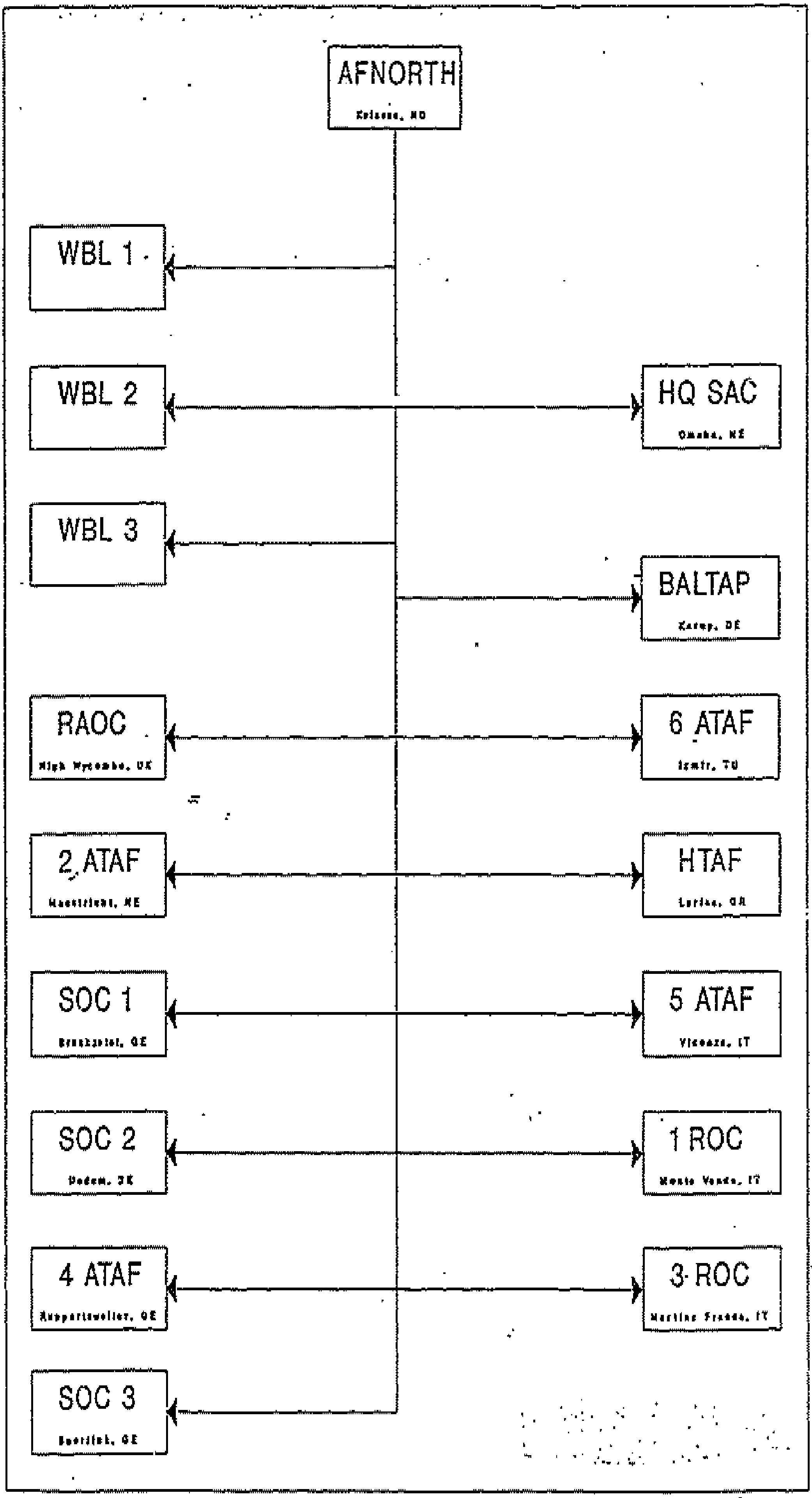

Figure 8. Alternative AFNORTH Milstar Target Flow Network

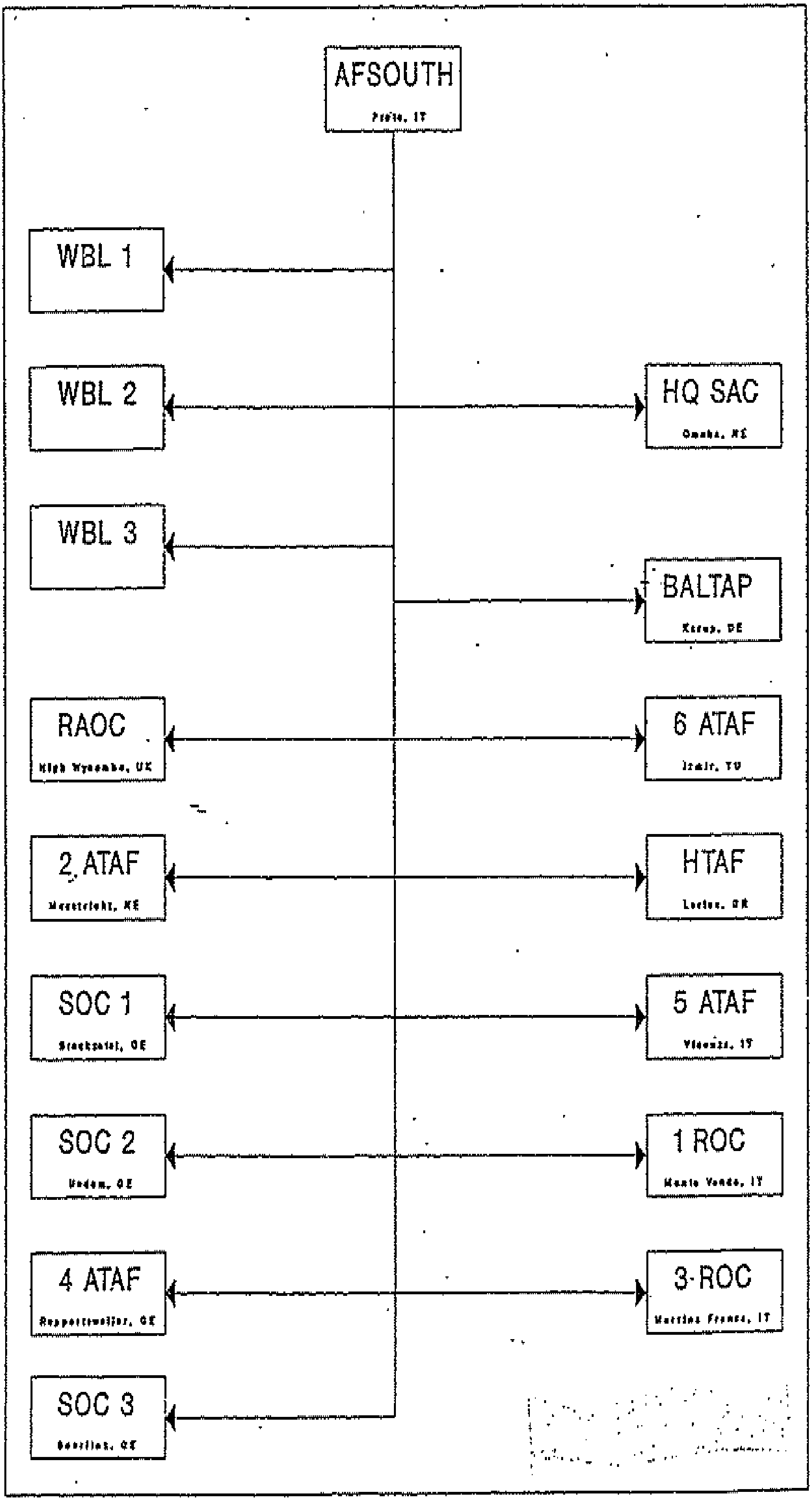

Figure 9. Alternative AFSOUTH Milstar Target Flow Network

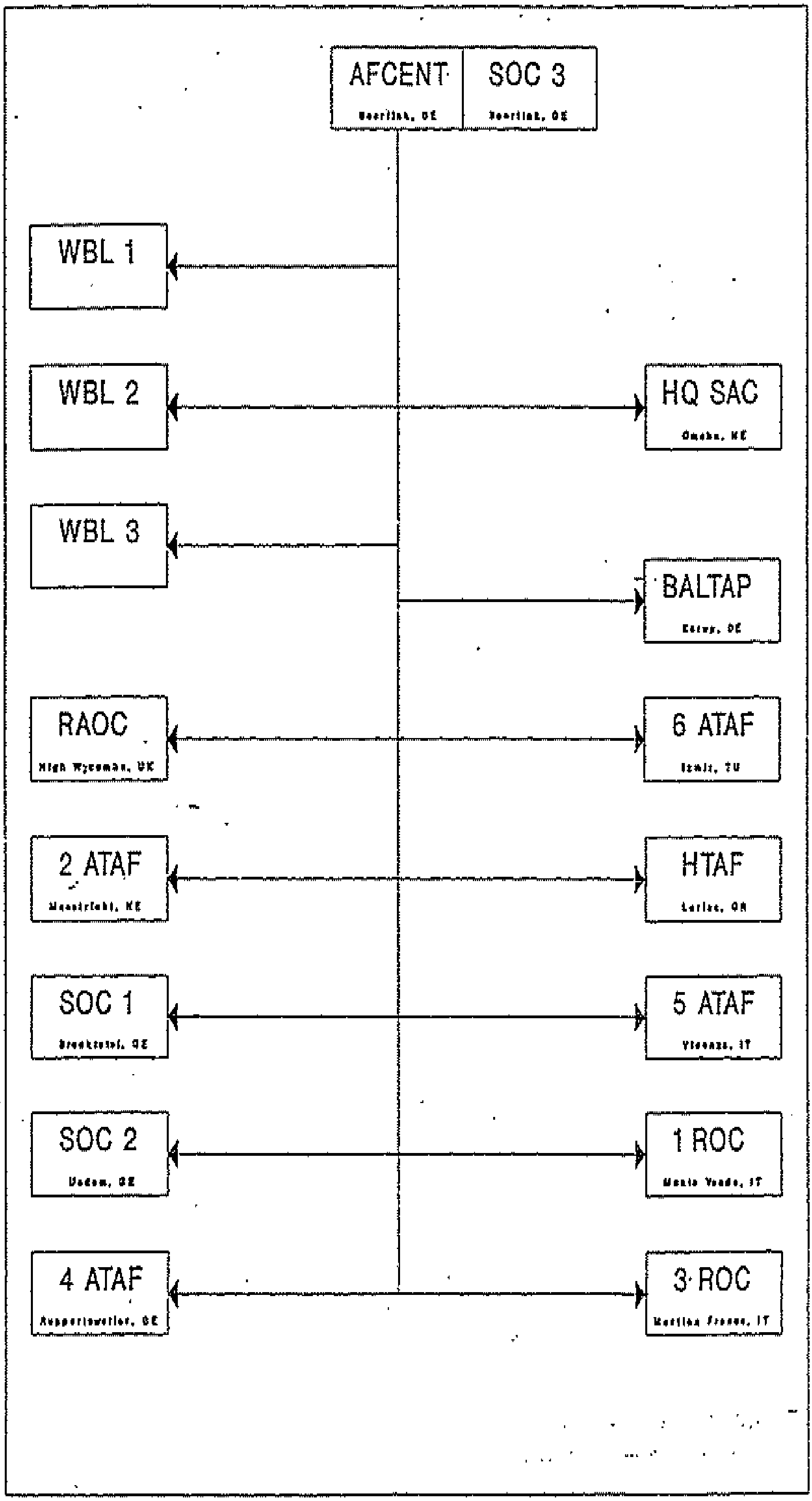

Figure 10. Alternative AFCENT Milstar Target Flow Network

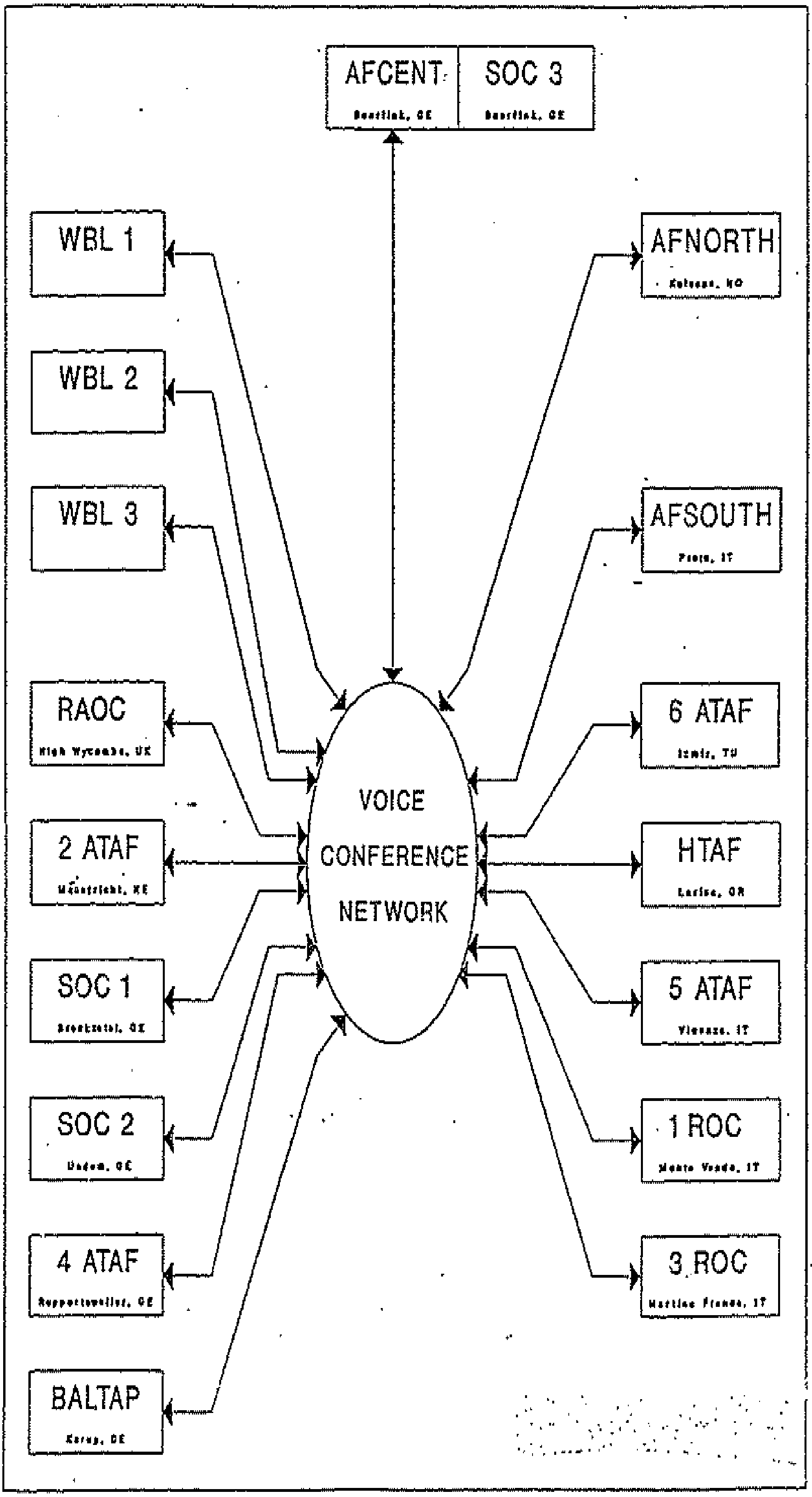

Figure 11. Milstar Support Package Coordination Network

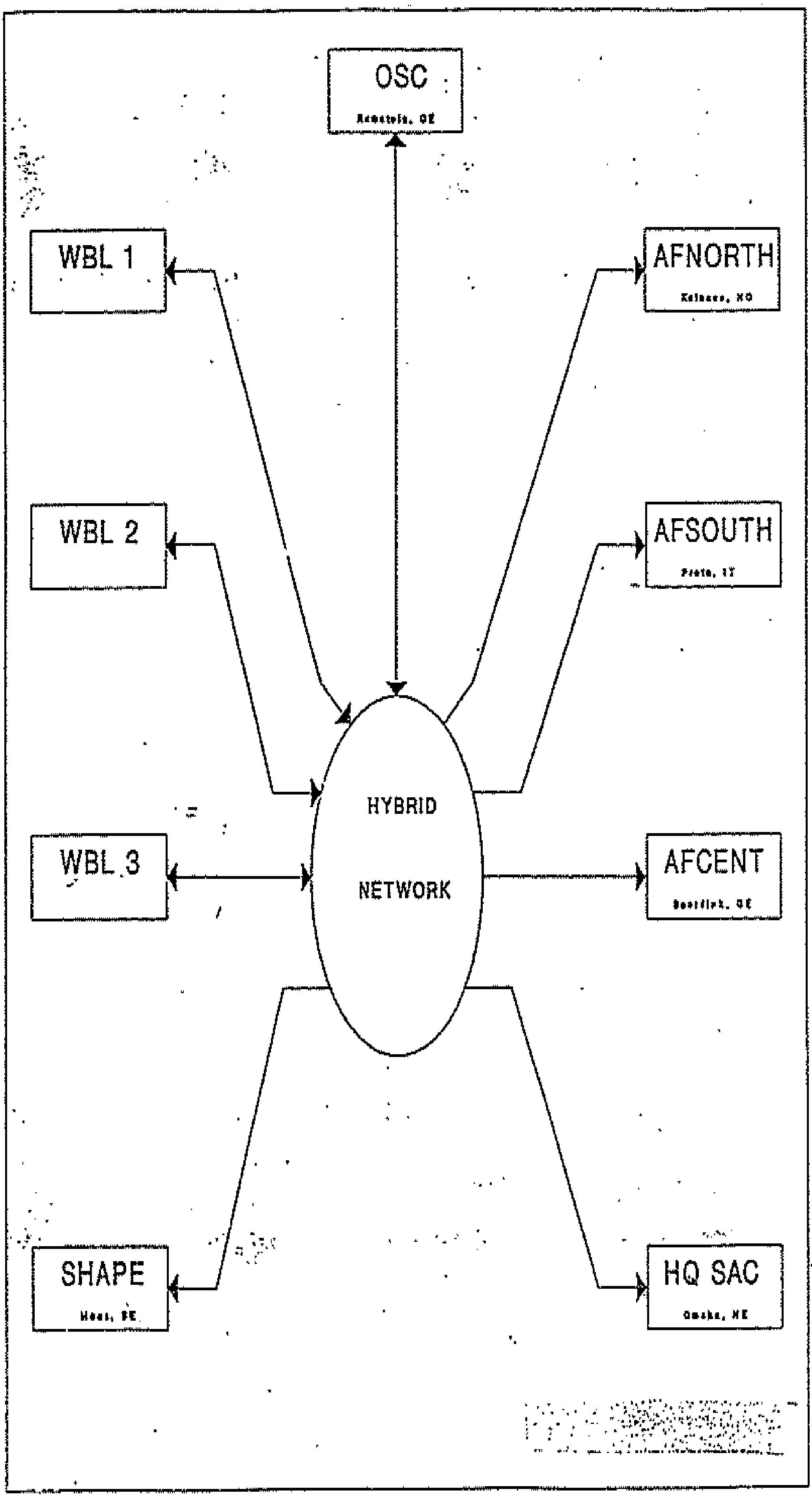

Figure 12. Milstar Availability/Status Network